

HOW TO DESIGN A SIMULATION EXPERIMENT?

A simulation experiment is a test or a series of tests in which meaningful changes are made to the input variables of a simulation model so that we may observe and identify the reasons for changes in the performance measures. The number of experiments in a simulation study is greater than or equal to the number of questions being asked about the model (e.g., Is there a significant difference between the mean delay in communication networks A and B?, Which network has the least delay: A, B, or C? How will a new routing algorithm affect the performance of network B?). Design of a simulation experiment involves answering the question: what data need to be obtained, in what form, and how much? The following steps illustrate the process of designing a simulation experiment.

Step 7. Select appropriate experimental design.

Select a performance measure, a few input variables that are likely to influence it, and the levels of each input variable. When the number of possible configurations (product of the number of input variables and the levels of each input variable) is large and the simulation model is complex, common second-order design classes including central composite, Box-Behnken, and full factorial should be considered. Document the experimental design.

Step 8. Establish experimental conditions for runs.

Address the question of obtaining accurate information and the most information from each run. Determine if the system is stationary (performance measure does not change over time) or non-stationary (performance measure changes over time). Generally, in stationary systems, steady-state behavior of the response variable is of interest. Ascertain whether a terminating or a nonterminating simulation run is appropriate. Select the run length. Select appropriate starting conditions (e.g., empty and idle, five customers in queue at time 0). Select the length of the warm-up period, if required. Decide the number of independent runs - each run uses a different random number stream and the same starting conditions - by considering output data sample size. Sample size must be large enough (at least 3-5 runs for each configuration) to provide the required confidence in the performance measure estimates. Alternately, use common random numbers to compare alternative configurations by using a separate random number stream for each sampling process in a configuration. Identify output data most likely to be correlated.

Step 9. Perform simulation runs.

Perform runs according to steps 7-8 above.

Task

In line with the group project that we are working on, proceed with the project upto the 9th step based on this week's lecture materials. The task will be assessed on Friday 7 July 2023, 12:00pm. Be sure to submit your work on emasomo.